Structure of the Fat Globule Membrane [1]

Abstract

An electron photomicrograph of a shadowed fat globule membrane fragment is presented. The structural characteristics are interpreted to represent a protein layer on which lipoprotein micelles are adsorbed.

Fat globule membrane material was prepared by churning thrice-washed cream. The reddish-brown, "buttermilk" phase was centrifuged to yield a 7,500 S pellet. A portion of the membrane fraction was dispersed in distilled water to about 1% concentration, fixed in 1% glutaraldehyde (0.2 ml/2 ml of 1% agent), further diluted and dispersed on glass slides by dipping. The specimen was post-fixed in OsO_4 vapor for 15 min, air dried, and shadowed with platinum-carbon at a 3:1 angle (arc tan ⅓). The carbon film was floated on to water and picked up on copper grids. Electron microscopy was performed with an RCA EMU-3G scope operating at 100 kv and using a 25 μ objective aperture.

A representative membrane fragment is shown in Figure 1. The rough-appearing surface is reminiscent of an erythrocyte ghost. Because of the relatively low lipid (11%) and high protein (89%) content of the membrane fraction from which this specimen originated, we hypothesize a membrane structure consisting of highly associated proteins to which lipoprotein micelles are adsorbed (1). The crater-like structures evident on the surface may represent sites at which lipoproteins were originally adsorbed but subsequently desorbed in the preparation process.

Reference

(1) Swope, F. C., and J. R. Brunner. 1969. Macrostructure of the fat globule membrane of cow's milk. Unpublished results.

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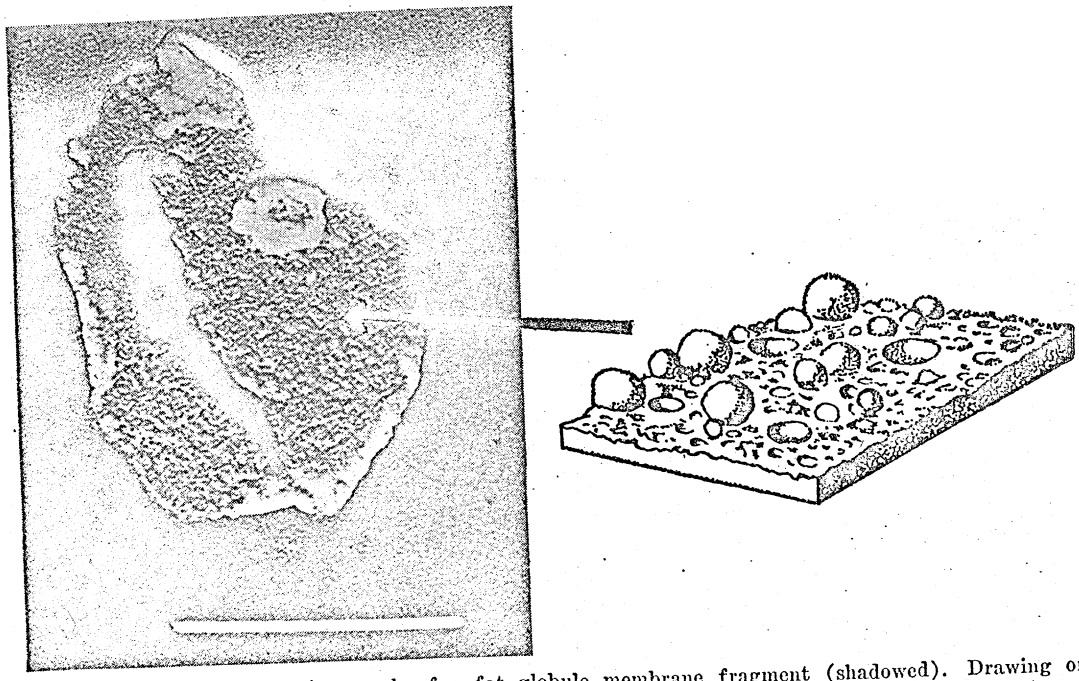

FIG. 1. Electron photomicrograph of a fat globule membrane fragment (shadowed). Drawing on the right represents the authors' schematic interpretation of the membrane surface. No attempt was made to scale the schematic to the actual specimen, but it approximates a 10- to 20-fold magnification. Scale marker at base of micrograph is one micron.